BAYOU PLAQUEMINE BRULE TMDL

FOR TOTAL DISSOLVED SOLIDS (TDS)

Subsegment 050201

US EPA Region 6

Final

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody. A TMDL has been developed for total dissolved solids (TDS) for the Bayou Plaquemine Brule (subsegment 050201).

Bayou Plaquemine Brule subsegment 050201 was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for fish and wildlife propagation. Louisiana's water quality standard for total dissolved solids (TDS) is 260 mg/l for the protection of fish and wildlife propagation (Subsegment 050201). Louisiana's water quality standards for chloride, sulfate, and TDS are applied as follows:

> "Numerical criteria for these parameters generally represent the arithmetic mean of existing data from the nearest sampling location plus three standard deviations. For estuarine and coastal marine waters subsegments in Table 3 that have no listed criteria (i.e., designated N/A), criteria will be established on a case-by-case basis using field determination of ambient conditions and the designated uses. For water bodies not specifically listed in the Numerical Criteria and Designated Table, increases over background levels of chloride, sulfate, and TDS may be permitted. Such increases will be permitted at the discretion of the office on a case-by-case basis and shall not cause in-stream concentrations to exceed 250, 259, and 500 mg/l for chloride, sulfate, and TDS, respectively, except where a use attainability analysis indicates that higher levels will not affect the designated uses. In permitting such increases, the office shall consider their potential effects on resident biota and downstream water bodies in addition to the background conditions. Under no circumstances shall an allowed increase over background conditions cause any numerical criteria to be exceeded in any listed water body or any other general or numerical criteria to be exceeded in either listed or unlisted water bodies."

For the purpose of TMDL development, the criterion of 260 mg/l was applied. The TDS TMDL was developed based on simple dilution calculations using average flow and the state TDS criterion of 260 mg/l for this subsegment. The TMDL calculation includes wasteload allocations, load allocations, and a margin of safety. A 9.5% reduction in TDS loading will be needed to meet the standard for the propagation of fish and wildlife.

1. Introduction

Bayou Plaquemine Brule, subsegment 050201 of the Mermentau Basin was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for the propagation of fish and wildlife. Subsegment 050201 was ranked as a high priority (1) on the 1998 list. A TMDL for total dissolved solids was developed in accordance with the requirements of Section 303 of the federal Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL also establishes the load reduction that is necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The wasteload allocation is the load allocated to point sources of the pollutant of concern, and the load allocation is the load allocated to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions and data inadequacies.

2. Study Area Description

2.1 Bayou Plaquemine Brule Watershed, Subsegment 050201

Berger et al. (1999) describes the Bayou Plaquemine Brule watershed as such:

"This area is typical of the basin with its low relief, which is an ideal condition for agricultural use as documented in Table 1. Segment 0502 is comprised of Bayou Plaquemine Brule as the main stem with several tributaries. These tributaries include Hazelwood Gully, Coles Gully, Long Point Gully, Bayou Wikoff, Bayou Blanc and North Coulee Trief.

Average annual precipitation in the segment, based on the nearest Louisiana Climatic Station in Crowley is 56.91 inches based on a 30 year record (LSU State Office of Climatology). Land use in the Mermentau River Basin is largely agricultural, the primary crops being rice and soybeans. Originally, this area was covered by tall prairie grasses, among which there were scattered clumps of trees. (Soil Survey Acadia Parish Louisiana, USDA, SCS, Series 1959, No.15. Issued September 1962). In the segment under study, agricultural uses account for 89% of the total segment area. Land uses in Segment 0502 are shown in Table 1 below (Volume 6, Nonpoint Source Pollution, State of Louisiana Water Quality Management Plan, 1993)."

Table 1. Land uses in Segment 0502 of the Mermentau River Basin (Berger et al. 1999)

Land use	Acres	%
Urban	12,259	3.5
Extractive	1,838	0.5
Agricultural	316,160	89.0
Forest Land	13,475	3.8
Water	536	0.2
Wetland	10,450	2.9
Barren Land	484	0.1

2.2 Water Quality Standards

The designated uses for Bayou Plaquemine Brule include the propagation of fish and wildlife. TDS is one indicator used in the assessment of use support. Louisiana's water quality criterion for TDS is 260 mg/l (Subsegment 050201).

2.3 Identification of Sources

The sources identified in the *1998 Louisiana Water Quality Inventory* as affecting the water quality of Bayou Plaquemine Brule are irrigated and non-irrigated crop production and urban runoff/storm sewers (LDEQ 1998). Agriculture in the watershed includes row crops, such as sugar cane, corn, sweet potatoes, and soybeans, and some ranching. Other sources of contamination are wild and domesticated animals.

2.3.1 Point Sources

The Bayou Plaquemine watershed includes 66 known dischargers, according to LDEQ's permit tracking system (Berger et al., 1999). Many of these dischargers are small and/or adequately distant from Bayou Plaquemine Brule and assumed to have a minimal effect on water quality in this subsegment. Sixteen larger facilities discharging sanitary wastewater directly into Bayou Plaquemine Brule and its tributaries were specifically included in this model. The combined flow of all these discharges is 5,277,000 gallons per day (see Table 2).

Table 2. Dischargers in Subsegment 050201

Dischargers to Bayou Plaquemine Brule			
Facility	Permit #	Discharge Flow	Wasteload *
		(mgd)	(lb/day)
Union Pacific Products	LA0005444	0.096	208
Canal Refining - Church Point	LA0006963	0.05	108
City of Church Point POTW	LA00038598	0.8	1735
Baker Performance Chemicals	LA0064661	0.0001	0.217
City of Crowley Water Plant	LA0069833	0.068	147
Wright Enrichment Inc. - Crowley	LA0072184	0.001	2
Plastics, Inc. of Rayne	LA0084841	0.0015	3
Acadian Fine Foods ltd.	LA0085723	0.074	160
City of Crowley POTW	LA0041254	2.5	5421
Opelousas Electric Power Plant	LA0036145	0.003	7
Village of Estherwood POTW	LA0064530	0.08	173
DePree transport Inc. - Church Point	LA0089036	0.003	7
Acadiana Treatment - Atwood Acres	LA0074896	0.046	100
North Rayne POTW		0.02	43
Crowley High School POTW		0.034	74
City of Rayne POTW	LA0039055	1.5	3253
Totals		5.277	11,442

*WLA calculated using design flow and 260mg/L TDS criterion

2.3.2 Nonpoint Sources

The predominant land uses in the Bayou Plaquemine Brule watershed are agriculture and urban, both of which may contribute to TDS loads through runoff. Besides row crops, there are numerous acres of pasture/grazing land in the watershed where cattle and horses are raised. There are also numerous rural residences where other domesticated animals may be found.

3. TMDL Load Calculations

3.1 Current Load Evaluation

TDS loads have been calculated using the instream TDS concentration and the flow of the stream. The following equation can be used to calculate TDS loads.

Equation 1. C x Q in cfs x 5.39 lb/day or C x Q in MGD x 8.34 lb/day

Where: C = concentration in mg/l
Q = stream flow in cfs or MGD

A traditional expression of the loading may be developed by setting one critical or representative flow and concentration, and calculating the TDS load using Equation 1. The difficulty with this approach is in the determination of the appropriate flow or concentration value to use. LDEQ has monthly monitoring data for two locations in Bayou Plaquemine Brule: near Estherwood, and at Refinery. For the purpose of calculating the current TDS load in Bayou Plaquemine Brule, the data from the Estherwood site was used because it contained more than 5 years worth of data. Greater than 30% of the TDS measurements exceeded the TDS criterion of 260 mg/l (see data at http://www.deq.state.la.us/surveillance/wqdata/0004wqng.txt). For the purpose of calculating current loading on this waterbody, the average TDS concentration from 4 years and 5 months of data was calculated. In Bayou Plaquemine Brule at Estherwood, the monthly TDS concentrations ranged 152 mg/l to 728 mg/l over a 4-year, 5-month period (January 1994 - May 1998). The average TDS concentration is 287.4 mg/l. In addition, the average flow for Bayou Plaquemine Brule at Refinery is estimated to be 700 ft^3/sec (see Appendix A). Using these values and Equation 1, it is estimated that the current loading is 1,084,360 lb/day.

3.2 TMDL

Point sources usually have a defined critical receiving stream low flow such as the 7Q10 (or Harmonic mean flow) at which the criterion must be met. For nonpoint sources it is recognized that there may be no single critical flow condition. The load reduction needed to meet the water quality standard for propagation of fish and wildlife in Bayou Plaquemine Brule at 700 cfs is 103,380 lb/day (9.5% reduction). This was obtained by calculating the allowable TMDL at 700 cfs for the 260 mg/l criterion (980,980 lb/day) and subtracting this load from the observed load of 1,084,360 lb/day.

Current Load - TMDL = Load Reduction

1,084,360 lb/day – 980,980 lb/day = 103,380 lb/day

3.3 Wasteload Allocation (WLA)

The Louisiana Water Quality Regulations require point source discharges of treated sanitary wastewater to maintain in-stream TDS water quality standards of 260 mg/l on this subsegment. Therefore, there will be a need to include TDS limits as the permit requirements based upon a wasteload allocation resulting from this TMDL.

Equation 1 can be used to calculate the total point source load (wasteload allocation) utilizing a TDS concentration of 260 mg/l and the total volume of all the wastewater dischargers (5.277 MGD).

260 mg/l x Q in MGD x 8.34 = WLA

Where Q = Total volume of sanitary wastewater discharges into Bayou Plaquemine Brule

WLA for all dischargers = 11,442 lb/day

Wasteload allocations and dischargers in subsegment 050201 have been listed in Table 2.

3.4 Load Allocation (LA)

The load allocation for a given flow can be calculated using Equation 1 and the following relationship:

(TMDL@ given flow and criterion) - (WLA) = LA

LA at an instream flow of 700 cfs = 969,538 lb/day

980,980 lb/day (TMDL@ 700 cfs) – 11,442 lb/day (WLA) = 969,538 lb/day

3.5 Seasonal Variability

Louisiana‘s water quality standard for TDS is for January through December. Therefore, no seasonal TMDL for TDS was developed.

3.6 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration a margin of safety. EPA guidance allows for the use of implicit or explicit expressions of the margin of safety or both. When conservative assumptions are used in the development of the TMDL or conservative

factors are used in the calculations, the margin of safety is implicit. When a percentage of the load is factored into the TMDL calculation as a margin of safety, the margin of safety is explicit. In this TMDL for TDS, conservative assumptions have been used and therefore, the margin of safety is implicit. These conservative assumptions are:

- Using average flows to calculate current loading to obtain load reduction.
- Treating TDS as a conservative pollutant, that is, a pollutant that does not degrade in the environment.
- Using the design flow of the point source dischargers rather than actual average flow rates, which are typically much lower

4. Other Relevant Information

Although not required by this TMDL, LDEQ utilizes funds under Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act to operate an established program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been established by the time the first priority basins are monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following establishment of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Mermentau River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins
1999 - Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

5. Public Participation

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999, Court Order, EPA prepared this TMDL. After submission of this TMDL to the Court, EPA commenced preparation of a notice seeking comments, information and data from the general and affected public. Comments and additional information were submitted during the public comment period and this Court Ordered TMDL was revised accordingly. EPA has transmitted this revised TMDL to the Court, and to the Louisiana Department of Environmental Quality (LDEQ) for incorporation into LDEQ's current water quality management plan.

REFERENCES

Berger, Jr., William C, Jay Carney, and Richard K. Duerr. 1999. *Bayou Plaquemine Brule Watershed TMDL for Dissolved Oxygen Including Eight Point Source Wasteload Allocations and a Watershed Nonpoint Source Load Allocation, Subsegment 0502, Volume I*. Water Quality Modeling Section, Watershed Support Division, Office of Water Resources, Louisiana Department of Environmental Quality, Baton Rouge, LA.

LDEQ, 1993. State of Louisiana Water Quality ManagementPlan, Volume 6, Part A: Nonpoint Source Pollution Assessment Report. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, LA.

____, 1998. *State of Louisiana Water Quality ManagementPlan, Volume 5, Part B: Water Quality Inventory*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, LA.

LDEQ Ambient Network Database (http://www.deq.state.la.us/surveillance/wqdata/0004wqng.txt).

APPENDIX A. Flow information

January 27, 2000

DETERMINATIONS OF AVERAGE STREAMFLOW FOR SELECTED LADEQ WATER QUALITY STATIONS IN LOUISIANA.

Note: *The* "average streamflow" is defined to be the annual average streamflow.

Bayou Plaquemine Brule at Refinery (DEQ 650) - Based on the runoff for the USGS station on Bayou Des Cannes near Eunice (best available estimator), 2.11 CFS per square mile, and a drainage area for the 650 site of 331.87 square miles, the average streamflow is estimated to be 700 CFS. The May - October average flow is estimated to be about 73% of the annual average flow; the November - April average flow is estimated to be about 127 % of the annual average flow.